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ABSTRACT

The paper describes a participant observation study of a 3 week summer art program for Apache middle school students on the White Mountain Reservation. Computer art skills, specifically animation using a menu-driven computer paint program, were the focus of the investigation. Because it was in the context of a summer program, instruction was laissez-faire on the whole. A number of themes and issues emerged, although conclusions are tentative since this is an exploratory study. One issue addressed is a traditional respect for land and animals versus an attraction to popular culture. Another issue is a lack of time and serious attitudes toward art which resulted in a tension between computer play versus computer thinking. A third issue is lack of invention; students seemed resistant to creating their own artwork. Younger students seemed less reliant on such tricks, and there was evidence of more accomplished results from younger students than older ones. Gender and social differences arose, such as boys trying more advanced effects but with less perseverance than girls. Themes of nature versus free drawing seemed to contradict Gardner's "free drawing" theory and support Wilson's assertion that cultural environment has an effect on content. The most significant theme that emerged is that Apache students create stories as life-affirming relationships instead of emphasizing on plot development and intense activity. The paper closes with recommendations about a more hands-on instructional approach to teaching computer animation, a call for more research on teaching computer animation, and greater use of computer programs among minority populations. (Contains 33 references.) (KC)

An Exploratory Study of Apache Middle School Students' Computer Animation

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Abstract

The purpose of this study is to computer art making skills, especially animation that middle school Apache students accomplished in a three-week summer program on the White Mountain Reservation. Participants experimented with Kid Pix, a menu-driven, computer paint program. Teaching was mostly individual appraisals and student spontaneous directions. In the beginning, students played computer games, initially resisted drawing, and experimented with abstract design effects. Later they painted background landscapes and drew or combined stamps to create characters for their animation slide shows. Popular tools were stamps, shatter, and explosion effects. Of significance are gender differences. Time restraints limited student critical activities to informal oral interviews. Results were realistic sunset and mountain scenes, connected to Apache respect for land, especially the sunrise ceremony. Animation results consisted of time and weather effects, moving human and animal characters, and size changes. Some students used abstract effects to communicate their feelings about a concurrent, devastating forest fire.

Issues include traditional love of land and animals versus attraction of growing popular cultural stereotypes, more accomplished results from younger students than older ones, gender and social differences, representational anxiety versus exploratory abstract effects, themes of nature versus free-drawing, reliance over premade stamps and collage making, stories as life-affirming relationships versus plot development; computer play versus computer thinking.

An Exploratory Study of Apache Middle School Students' Computer Animation

What kinds of computer art making and art criticism responses can Apache middle school students accomplish in a summer program? Researchers have explored computer graphics courses with gifted adolescents (Stokrocki, 1986), teachers (Stokrocki, 1990) and university students (Freedman, 1992). Greh (1986) noted a preference for realistic portrayal during the first weeks of her computer course with Koala pad for high school design students. Freedman (1989) discovered facets of divergent thinking with Paint programs and social life in two elementary and one high school class in a school year. Studies of different cultural populations, however, are practically nonexistent. Wohlwill and Wills (1987) described the designs of middle school students, mostly volunteers, using BASIC programming at Pennsylvania State University. Chia and Duthie (1993) documented and evaluated the computer progress of fifth graders' with the Aldus Superpaint program in Singapore. These children were high art achievers and the programs contained more cognitive control. What kinds of computer art making and art criticism responses can Apache middle school students accomplish in a summer program?

Method

Participant Observation is a multi-person, multi-technique, and multi-concept form of research. It also is a systematic study of an everyday event by searching for patterns of behavior and meaning (Spradley, 1980). It implies learning from people not just studying them (Denzin & Lincoln, 1994).

Procedures. Research unfolded in three stages: data collection, content analysis, and comparative analysis (Strauss & Corbin, 1990). I used daily note taking, photography, questionnaires, and interviews for data collection. I couldn't use audiotape because teacher and students were soft spoken.

Content analysis involved coding my notes for repetitive student behaviors and meanings. Systematic photographing of the evolving student work at each stage was next. Comparative analysis is the comparing of classes on different occasions and with external studies. I collected data for three weeks, everyday (8:00-11:00AM) for 36 hours. I also observed several students who returned for free time (two hours, two days per week or 12 hours) in the afternoons to finish their work. Total observation time was 48 hours. The researcher often filled in as teacher when students asked for help. The study became action research as we report problems and recommendations. Results are mostly descriptive in an effort to explore what children can do with an open-ended approach.

Participants. The observed art teacher, Marcia Buckpitt, has been teaching part time in this school for seven years. She received her BS in Art Education, MA in Printmaking, and M.F.A. in Book Arts from University of Wisconsin, and is certified in Arizona. She taught printmaking at Princeton University, the community college level, and has been self-employed as a graphic artist and illustrator of children's books for over 15 years. She loves working with Apache children "because they are so respectful and well behaved." Her Principal, Jim Hall, is very supportive of the program. He commented, "Students love the technology and can develop their drawing abilities." Children receive regular computer training during the year. Only one student had a computer at home. Buckpitt offered computer art to interested students so she could learn more about the technology, inspire the students to tell stories (part of their oral history heritage), and learn more about art though art criticism inquiry tools. During the year, she incorporated lessons on face expressions, figure drawing, and an artist of the month incentive. The Principal hired Albert and Eileen, Native American high school students who both love computers, as lab assistants.

I focused on two classes. One class of sixth graders (10 students) consisted of seven females and three males. A second class of eighth graders (10 students) included five males and five females. I administered a prequestionnaire to students to determine their knowledge of art and computers. When asked, "What is art?" most students replied drawing (7/10 at the sixth grade and 8/10 at the eight grade). This answer clearly indicated their teacher's drawing preference as well. Other answers from the older class were crafts (3/10) and painting (3/10). When I asked what kind of art do they make at home, 50% of the students answered drawing (10/20). Then I inquired what was computer art? Older students responded drawing (5/10) and animation (4/10) and younger students mostly answered drawing on the computer (8/10).

Contextual Description

History. McNary Elementary School is on the historical Fort Apache Indian Reservation. The White Mountain Apache Tribe inhabits 1.6 million acres of its ancient homeland (White Mountain Apache Tribe, 1999). While the White Mountain Apache descended from nomadic ancestors, they settled and raised livestock and agriculture.

The public schools started with the lumber industry and paper mill. Southern Afro-American families relocated here to work in the mill Chilcote, 1985). The elementary schools were segregated until 1968 (Personal correspondence, Guy Morris, June 9, 1999). A new elementary school will soon replace the present one, built of pine, because it is a fire hazard.

The chief industries now are tourism, the timber mill, and a re-manufacturing plant (parts of the Apache helicopter), and the new Hon Dah Casino, run by the Apache Tribe. The Apache also retain and run a large ski resort; conduct yearly world class bone and crocker record elk hunts, and offer fishing of rare Apache and rainbow trout. The Tribe consists of approximately 12,000 members, spread over nine communities. White River is

the capital and the largest community. "The topography ranges from 11,000 feet to 3,000 feet at the Salt River Canyon" (White Mountain Apache Tribe, 1999, p. 1). Nearby is the Apache Cultural Museum that preserves its traditions dating back to Geronimo. These traditions include the Corn dance, basketry, and female puberty ceremonies during the summer, beginning in May (White Mountain Apache Tribe, 1999).

Facilities. McNary Elementary School is located in a forest of pine trees about four miles outside of a small working class community. The present building, erected in 1947, houses grades three to eight, the library, nurse's office, and computer room. Other buildings are the art facility, gym, cafeteria, K-2 classrooms, administration office, and the bus barn.

The computer room, where the observations occurred, is large (45' x 22') and has two attached offices. The room contains 18 Macintosh computers on two sides of the room, one instructional GE model in the middle, two printers (Lazer Jet and HP ink jet), a videorecorder, and a scanner. As you walk into the room, the right wall contains three 4x8' bulletin boards and an eraser board (4'x 8'). The back wall has a screen and the left wall consists of glass windows leading into the offices. Above the windows are three lettered posters (Apache, Navajo, and Hopi) and commercial cowboy reproductions. Some storage cabinets are located at the entrance.

Summer school program. Approximately 60 students registered in the three-week summer school program, although the small public school regularly enrolled 130 students. The program's purpose was to "give kids something educational and fun to do in the summer and keep them out of trouble"(Personal correspondence, Guy Morris, June 21, 1999). Many of the students are part of special education program during the year. The summer school program sponsored by the Apache Tribe, entailed math, crafts, physical education, and computer art classes. The half-day schedule consisted of breakfast, three half-hour sessions, and a half-hour break, followed by two

half hour sessions and lunch. On Fridays, the program also took students swimming, to basketball camp, and hosted a barbecue on the last day.

During the first week, we directed students to fill out a prequestionnaire, a drawing pretest (draw an imaginary character), and write answers to art criticism questions about a famous cartoon strip, Nemo in Slumberland (1908) by Winsor McCay.1 We also discussed their choice of Keith Haring's paintings and asked students to imitate one. We then introduced students to computer animation during the second week. During the last week, Buckpitt helped students to finish their computer animation. I interviewed students individually about their background landscape drawings, character design, and animation techniques. We ended with the screening of three examples of Japanese animation and gathered student reactions (Halas, 1986). This paper will focus on computer animation.

Results

This exploratory study functions as a foundation for future systematic research. The coding scheme evolved. After observing student animation artmaking carefully, certain features and style aspects emerged for scrutiny in a comparative investigation. Limitations are noted.

Lack of time and serious attitude towards art. Since each computer session was only 30 minutes, students had to create their artworks fast. During the year, art class is also a half-hour, so students rush to finish their assignments. A group meeting each day during the first period session limited the sixth grade class to only fifteen minutes. Other interruptions included basketball and Bible camps. When we tried to encourage some of the sixth grade boys to try another cartoon slide show, one boy remarked, "I'm not graded, I don't have to do it."

Imaginary drawing pretest. On the second day, we administered a pretest and asked students to draw "What they like to do in Apacheland?" Buckpitt and her daughter Jessica, who clarified students' insights, served as reviewers.

They both felt that the drawing of "a guy holding his tongue with random shirt pattern and protruding eyes was very good for its exaggeration. Buckpitt's favorite drawing was Jake's "Cow." She proclaimed it as a "wonderful example of a free form story." Jake informed us, "He's standing and eating, looks up [apparently scared], runs away on two legs, and hides behind a tree." The reviewers' second favorite was "Dino Rex on the Island." Buckpitt evaluated, "It has solid clouds, the dinosaur is proportional, and the drawing includes many details." She explained that the next example, "The Joker," was a solid drawing. The student didn't value his first attempt with this image in the art class and someone else won a prize for his idea. He drew this image for the pretest and substituted scissors instead of hands (June 8, 1999).

Lack of invention. Two girls copied each other by creating similar drawings of a character with the label, "I'm a loser," another popular fad. Buckpitt described, "The character has stylized clothes and a peace sign. The hairdo is tapered and wild. Beautiful line work in the hair--pure and clean." She added, "This other one has a balloon-shaped head with a massive blimp nose, carefully drawn fingers and freckles, like a picket fence. Also yo-yos are back in style." We invited students to duplicate their drawings on the computer and experiment with different design effects in the Kid Pix Program (Hickman, 1991). Fabulous beasts may be culturally appropriate in Singapore, but in Apacheland, students don't seem to invent imaginary figures but use familiar animals. Students either didn't understand imaginary or depicted popular cartoon examples.

Initial gender differences. In the beginning, the boys were constantly playing computer games such as the Prince of Persia (Mechner, 1993) and Snood (Dobson, 1996), a shooting interactive game. During free time, they also played with the truck and helicopter stamps or a compact disk that featured

hunting (Roberts, July 17, 1999). Wollwill and Wills (1987) also mention that boys respond more to video games than girls do.

"Boys also love gory things," added Lily Tortice, adult computer aide, (Personal correspondence, 7/17/99). One such gore example was a large pink cross with a bleeding rose in the middle. The blood design appeared as drops that they made by choosing the paintbrush tool and holding the mouse key down as a spill. Wollwill and Wills (1987) suggest that boys respond more to fantasy than girls do, but in this study the occurrence was slight.

The girls, in contrast, colored pictures, especially "Disco Party," in the Companion to Kid Pix. They also designed symmetrical "love" stereotypes as a teddy bear centrally placed on the page and overlapped with another smaller one. She informed me that it was a door sign for her room. Another girl started with a bear, added bows, roses, and stars from the stamp tools. Other girls always seemed to attach heart stamps in the four corners of their pictures. Freedman (1989) noted the preferences of boys for computer games and the girls for other functions, such as "making a birthday card" (Freedman, 1989, p. 294).

First computer images and experiments with computer tools. Students had many options to explore in Kid Pix. Favorite tools initially were stamps and any kind of explosion technique. Since quitting the computer program involved a bomb icon (under the erasing command) with accompanying sound effects. Boys always seemed to be blasting away. Later, one boy showed me the trick to freeze the design with option-control keys and I shared the name of the new design "concentric circles" by writing these terms on the eraser board. A second boy abstracted his "Joker" by using the straight-line tool (similar to the old Logo) to make the hat parts. He turned the angular drawing into a positive and negative pattern. Some of the younger girls discovered how to construct a rainbow ripple background and to place their characters on top of it. Tanya transformed her "loser" character into a computer image. She drew

its outline, added a parallel lined pattern, called northern lights, and the shatter effect, from the electric mixer tool. The northern lights effect is a "colorful aurora borealis which can be horizontal or vertical depending on which direction you move the brush" (Hickman, 1991, p. 20). Kids Pix enabled students to experiment with many patterns and special effects that were not possible with earlier computers and programs (Stokrocki, 1986).

Computer play. On the second day, Albert, a teenage computer aide, downloaded the video card to a favorite site and song, "Hit Me Baby" by Britney Spears that constantly reverberated throughout the class. On another occasion, I watched two second grade girls singing the lyrics. Jeffrey Roberts, part time computer teacher, noticed a "trickle down effect" in which high students discovered music videos on the computer during their free time. Now the young elementary students are anxious to play them. On one occasion, I noticed second grade girls flocking around Eileen. They were judging which N'Sync music singer was the cutest. One third grader exclaimed, "Justin dyed his hair real cool like! (Sic)" At the end of these classes, Buckpitt commented on these playthings, "I have negotiated with students that we have computer art on some days and free time on others. They are burnt-out too. If I don't do this, we'll lose them."Buckpitt summarized class mood, These kids are very talented and they tend to rush through these assigned projects to get to the computer play, which now acts as a reward." Other researchers noted the significance of initial computer play, such as video games (Greh, 1986; Stokrocki, 1986; Wohlwill & Wills, 1987).

Computer problems. Periodic problems occurred, such as no access to the Internet (6/10/99) when I wanted students to see Keith Haring's website full of animated figures. At times some of the computers crashed, printers failed due to loose wire connections, and the photocopy machine was out of toner. On another occasion, a child accidentally unplugged an entire row of computers. Student aides knew little about maintenance. Although children received

regular training during the year, students did not remember commands and decorum. They would save their files everywhere. I had to show them how to create a folder for all their work; trashes unidentified files, or even empty the Internet cache that others jammed with downloaded baggage.

Students as teachers. Students were very excited about special design effects. For example, Cal made a kaleidoscopic design by hitting the swirl paint tool and then the control-option key to enlarge it. Another student also found it sensational, "Wow! It's like Star Wars hyperdrive!" He admitted that Albert had directed him as to the tool. Another student enlarged a kimono design that he found under the stamp tool (under Companion Shapes). The entire menu row had Japanese icons that he couldn't identify. He showed me how to enlarge the stamp by hitting three keys, "shift, control, and option." Throughout the class, students shared their "neat" ideas and procedures.

Eavesdropping and copying. Students often eavesdropped on each other for ideas or procedures. On one occasion, I photographed three girls in a row who copied rainbow backgrounds. The two boys in back of them had identical landscapes starting with fluffy clouds in the sky, sun in corner, and mountains below. They then added pine tree foliage from the "mix tool." Some students added a few stamps; for instance, trees, moon, and stars.

Landscape backgrounds dominant. Most students chose to draw asymmetrical landscapes. More confident students started drawing backgrounds and filling in colored areas on the computer. No one made sketches on paper. Calvin created a simple mountainscape. He first chose a mountain stamp, enlarged it, and printed several in a row. Then he drew a ground line, filled the area with brown paint, overlapped it with a purple diagonal road, and stamped roses along the bottom of the page. Next, he filled the sky with a dark purple color, added two rows of overlapping stamped clouds, and added several stamped lightning bolts. Later he added a random spot pattern for

texture. This piece was environmentally significant because it realistically recalled the afternoon thunderstorms that the region experienced each day. Indeed, the Apaches names one of their mountains "thunder mountain."

A second example was a desert road in perspective. Nicole started with the two receding lines that met in a vanishing point, filled the road with gray color, and drew a yellow dotted stripe over the road. Next she filled in the large desert areas with brown paint, colored in the mountains with brown. She then filled the sky with a brilliant red-orange color and added a yellow sun behind. She even added dark brown shadows that reflected from the mountains. The next day, I saw her paint five saguaro cacti of various sizes with shadow reflections. One large cactus was on the left, which she identified in her interview as asymmetrical. She added colored to cactus blossoms and parallel rub lines that bent with the cactus contour. The entire scene glowed as a sunset.

Some students (2/10) made abstract scenes. Brianna, for example, made an abstract background with the mixer tool. First she created a horizontal sunset effect, described previously, and superimposed a radial burst by positioning the spiral tool in the center. She transformed the scene into a forest fire by adding different sized stamped trees, flames, and thunderbolts. The effect was powerful because a devastating fire actually occurred on the reservation that week.

Computer and limited animation. Jake (8th grade) previously taught us how to use the Kid Pix Slide Show Program. When I asked him why he used a cow he responded that it was easier. I mentioned that he didn't have to draw the cow every time, but could do the animation in a limited way and prepared an example using his cow body. I drew the steps on the computer and directed students to paint and duplicate the background first about 10 times (Monday, 6/13/99). At this point, the researcher was draw into the study. Buckpitt remotivated students the next day with her animation example, "Evening Walk."

Her animated character represented herself. She directed, "In one frame without a background, draw the character once, duplicate it; redraw the arms and legs, move it slightly to the right, duplicate and redraw parts. Later cut and paste it into each background frame." Students were excited and started drawing right away (6/14/99).

In-process appraisal instruction dominant. Summer programs seem more laissez-faire, so everyday teaching usually consisted of a five-minute introduction of something new or a review of what was previously learned. Buckpitt explained that the Apache children listen intently to directions. Most instruction was in-process appraisal, the monitoring of individual student technical process and drawing progress. For example, Ty asked how to make a slide show. Buckpitt introduced and reviewed the steps as he performed them. She directed, "[Choose] file, open your scene and repeat it 10 times as scene one, scene two, etc." Later, she continued her directions, "Press 'Delete'; choose 'Save as;' type your name and the words_slide show. Go to File, click 'Save as,' delete the number 5; add the next number 6; go to 'File' and 'Save.' Now you do it." She repeated this litany of directions several times during the classes. Later, I suggested that we write directions on a chart. Marcia responded, "That's so obvious. Next time, I'll hand them a handout with some illustrations." Other recurring problems included students losing their work in the computer and our searching for it, under the File and Find commands.

Animating stamps were popular. Most students incorporated stamps in the background, but 50% of the students animated them. As an example, Jake designed another slide show and repeated a truck stamp to move across the scene from left to right. He switched the stamp image to a fire engine that flipped in the opposite direction (stamp editor tool). When I asked him to add his own images, he refused because he felt that he already knew how and did enough. Noah (6th grade) wanted to incorporate his realistic lion (that

he discovered under the hidden image tool) in the landscape. Buckpitt defended him, "Trust him and he does the most amazing things." The next day, however, he overlapped and animated an ant and helicopter, chosen from the stamp tools. At the end, he enlarged the helicopter in one frame. She complained, "I had to help him every step of the way. He only did it to please me because he would rather play."

Sunsets (6/10) and night landscapes (4/10) were dominant. Nearly all students made realistic landscapes (8/10). Four backgrounds included mountains, eight scenes included trees (cacti substitute for trees), and six pictures used the sun or moon. Sunset/sunrise scenes were frequent with girls. The frequency can be interpreted in different ways: 1) aesthetically beautiful, 2) technically easy to make as a series of horizontal levels manipulated instantly; and 3) culturally representing the Apache female puberty change in the "sunrise ceremony" (Basso, 1970). One example, shows a girl sitting with her back to the viewer "looking at the sunrise," according to Elicia, the artist. Maye Hill, Navajo craft teacher, remarked, "This sunrise picture reminds me of my painting as a girl. I had an Indian lady here. Navajo people believe that if you face your door to the east at sunrise, all good things come into your house." Jackie Lavender, Apache teacher, added, "We Apache believe that too." She also announced that a friend's parents were sponsoring a Sunrise Ceremony for their daughter this weekend.

Animation results. From observation, I learned that children who may lack drawing confidence respond better to the simpler animation techniques, such as repeating stamps to show motion. Of the 10 older students that I interviewed, five students animated stamps. Two students cut-and-pasted their stamp figures to run from left to right. Others used stamps to suggest changing time and weather effects, such as twinkling stars (Lathena) and moving lighting and rain (Calvin). Some students (3/10) made the stamp change

size. Fifth grader, Janine, choose the horse stamp and placed it in the middle of her scene, which she called "Nighttime Magic." She moved it diagonally across her mountains into the sky and disappeared.

Fifty percent of the students (5/10) tried to draw human characters frame-by-frame. Two individual students attempted to show animation getting smaller. For example, Nicole added a man running down her desert road scene. In the first scene, the back of his head with hair texture appears with the words "I need WATER!" in a bubble. In subsequent scenes, she drew man's entire body smaller from the rear view. He is bending his right leg out at a right angle to his body and his left arm curls up. Creating a receding person requires patience to draw each figure individually and smaller.

Other noteworthy animation results included moving the background, lettering, and sound effects. Elicia, for instance, made her sunset move in several frames. She started her figure sitting with sun half way out, moved it down. The sky turned completely dark, with a small fraction of the move showing in the left corner, which she slowly moved to the left. Kim, a third grader, wrote her name with a multi-colored bubble tool effect. She superimposed it over her scene with her parents (a stamp) calling her home (house stamp). She moved the letters in various directions and found that if you force them into the corners, you can make them stretch in different directions. Kim thus suggested a change in parental volume. Students also chose musical effects. The statement "Wow" and the barking dog were the most popular. Because they were running out of time, some students selected one transition effect right after the other.

Post questionnaires results. During classes, some students complained that painting a background took too much time and included too many images. We therefore shortened the demand for a background with ten frames. Obtaining written responses from the younger fifth and sixth graders was "like pulling teeth," Buckpitt remarked. Marica, Eileen, Jessica (Buckpitt's visiting high

school daughter) and I read the questionnaires to students and wrote their comments. Part of the problem was the daily shortening of their first period class and the fact that they hated to write answers due to their limited grammar and spelling abilities. No significant answers resulted. Occasional responses were that their favorite experiences in the class were drawing people but the frequent answer to the reason "Why" was "It's fun." Responses from seventh and eighth graders were more reliable. They explained that their favorite experiences were animation (6/10) and drawing characters (3/10) because they were "fun" (4/10). One third of them disliked "explaining things" (3/10) probably because it took time away from their computer time. When we asked what they learned, one third of the students (3/10) mentioned animation. Single answers were "how to draw easier" [limited animation]. Some students felt that the already knew techniques and other students answered "didn't know." When we asked how to improve the class, individual suggestions were to finish their work, practice, not mess up, tell a story, and don't know (4/10). Interviewing was more successful than filling out questionnaires. Learning about computer animation was the art making skill they enjoyed.

Interview results. When I asked older students how they were successful, many noted achieving realistic effects. For example, Nicole answered that her cactus with flower and its shadow gets smaller in the distance. Elicia mentioned, "It's [my character] real. The girl was hard to draw." Buckpitt summarized, "She takes her time, is careful, and sensitive. It's amazing to see the character still, but the sky move. She was the only one who reversed the process. The Apache are earth people--quiet." One boy enjoyed making "a lighted sky" [full of stars].

I also asked students what they learned and some students mentioned how to draw people in action. One student mentioned that next time, he "will make the lion and ant say stuff."

Outside responses. Computer art seems to motivate students in general and especially those with behavior and learning problems. Those students who do not perform well in other classes seemed to work straight through computer class. "They work at their own pace," remarked Roberts (Personal interview, 7/17/99)."They also know the rules," stated Lily Tortice, Adult Apache Computer Aide (Personal Interview, 7/17/99). In spite of such contextual problems as lack of time, computer woes, and obsession with computer games, and failure to complete assignments, students seemed to experiment in exciting ways. Other elementary art teachers reacted to the children's artwork, "Beautiful background color, "the twinkling stars are very appealing, and the horse's feet are very natural looking" (Personal correspondence, DiSiena, 7/14/99). This study supports Chia and Duthrie's (1993) claim that how children learn to make computer art is as important as what they learn.

Issues

Conclusions are tentative since this study is basically exploratory, so this section tends to discuss these findings in comparison to other studies. Students initially tend to resist drawing human figures due to lack of experience. Their first images also may be stereotyped but change with introduction of Kid Pix special effects, in contrast to persistent staid drawings achieved by the old graphic tablet and Koala pad. By substituting and recombining stamps with teacher encouragement, they can create new figural composites.

Younger students results more accomplished than older ones. During the last days, I interviewed Buckpitt, the computer teacher, and older students. Buckpitt described computer art as "very accessible, instant motivation, and having a variety of possibilities and versions with little discipline problems." She was pleased with results and mounted a display of students' artwork with some of their final interviews. In review, the younger student

examples seemed more expressive and full of contrast than the older students. One fourth grade, for example, pictured a horse fleeing from a forest fire in a radial blast of colors. Several students depicted the fire that actually occurred on their reservation during my stay. Even the native teachers found this computer piece "full of life." Roberts praised, "Neat! I am amazed by their imagination and their ideas." Buckpitt felt that some of her older students could put more effort into their work." For example, the problem of contrast of figure and ground evolved when students printed their work. For example, when interviewing Jared (sixth grade) in regards to his animation, entitled "Frog Plague," I asked him if the frogs showed up well on the Egyptian background of pyramid and sphinx. He answered that the next time, he would make them darker and I added, "You can also make them lighter." Buckpitt felt that his work style was like "pulling teeth."

Gender differences. Boys seemed to persist in computer games and to experiment more with computer programs and special effects than girls. One boy taught us how to use the slide show program. On the other hand, some experienced boys may become overconfident and refuse to draw animated figures, which is time consuming. They preferred to animate stamps in different directions. This finding supports Freedman's (1989) discovery that boys often initiate their own computer experiences and gave more attention to movement. Experienced boys similarly were a problem in an earlier study of Caucasian gifted students in computer art (Stokrocki, 1986). Boys tend to explore more challenging computer functions (Wohlwill & Wills, 1987). They also tend to make different thematic choices, such as interest in team sports (Wohlwill & Wills, 1987). Apache boys preferred non-competitive activities, such as camping, trucking, and hunting.

Apache girls in contrast may depend on stereotyped images initially, but tend to patiently finish their complicated assignments. They also seem to depict human figures better than boys do and prefer symmetrical arrangement.

Chia and Duthie (1993) earlier noted gender differences in Singapore. Girls cooperatively worked better in pairs than boys. Perhaps in these cultural groups, girls are more rule dependent than boys are.

When students' drew human figures in their pretest, they to outline the figure from the feet up. I also observed a third grader draw a front view human freehand with the mouse from the feet up. These new computer representation tools, however, gave students more drawing options, such as ovals, thick brush, and spray paint. Furthermore, by learning limited animation, they discovered that they only had to draw the body and could change arms and legs. Only one student tried changing a face expression.

Students were usually quiet and the most frequent words "Darn! Darn! Darn" came from the computer, which is part of the Kid Pix program as students made mistakes or "bombed" their ideas. Time constraints and poor writing skills limit the reflective abilities of Apache middle school students. Students may be hesitant to respond to art criticism questions and art criticism takes practice. Attempts at art criticism in a three-week summer program tend to be exploratory and students' answers short.2 Directing students to look through a magnifying lens motivates them to look closer and discussing a provocative cartoon animation and videos introduces them to new photographic viewpoints. Several older students also helped younger ones in completing written questionnaires. In Apache tradition, talk takes time to translate and to gain trust (Basso, 1971).

Appraisal will continue to be individual, but a group of students involved in the in-process review of unfinished work may encourage new directions. Display of group work during class and as a final review also acts as a strong motivator (Stokrocki, 1990). Oral questionnaires with follow-up student interviews may help students reflect on the message of their work and to develop their visual and verbal expression. Students may give better responses to individual informal interviews. When students are

asked to teach the researcher how they made an image or used a tool, they are more responsive. Student reteaching, the demonstration of the evolution of an image, is a valuable research device for children who lack good writing skills (Stokrocki, 1999). Eventually, students will search for new ideas and ways of solving problems when they are ready.

Social interactions between younger children are more noticeable as they proclaim their excitement over a "neat" effect that they learned from a lab assistant or another student. Freedman (1992) explained this type of interaction as spontaneous direction, which "involved (often unsolicited) direction given to a student by one or more peers resulting in some change in an image" (p. 107). The short time limited longer periods of consultation or seeking advice from each other. Other types of interaction were subtler, such as instances of copying clouds or sunset effects.

With the introduction of animation, a shift in image making occurs from play attitude toward more serious image making, which consists of serial work. Serial work is the ability to change an image while saving the original. Freedman (1992) noticed a general shift from production to ideation in her university students' responses about their image development in serial work. Animation enables serial work to happen at an earlier stage.

Representational anxiety versus exploratory abstract effects. Although students in the stage of dawning realism (Lowenfeld & Brittain, (1975) struggle to achieve realistic effects due to their representational anxiety, computer tools give them freedom to explore abstract patterns, such as radial and random designs, and to substitute parts with stamp tools. Students can accomplish repetition and asymmetrical designs more readily with Kid Pix as opposed to the symmetrical limits of low resolution programming nearly 10 years ago (Stokrocki, 1986). Persistent use of computer premade stamps suggests that computer graphics has become the art of arranging images, often programmed by others, as predicted by Hubbard and Boling (1983). Often

students use stamps stereotypically and need to learn to re-arrange them into meaningful statements.

Themes of nature versus free drawing. Apache children tend to use subjects that reflect their love of the natural environment, such as frequent sunset, sunrise, and night scenes. We can interpret the scenes as copies, which children often do, according to the Wilsons (1977). These subjects, however, are part of their culture that is an ideology based on worship of nature. Frequent themes displayed in their school art works were landscapes and everyday outdoor activities, such as camping and fishing. This finding contradicts Gardner's (1980) preoccupation with spontaneous "free-drawing" and supports the Wilson's (1977) stress on the effects of themes from their cultural environment.

Stories as life-affirming relationships versus plot development. Most significant in this study is the fact that Apache children do not depict animated stories in the sense of developing a plot or intense activity. They construct a setting with time or weather change or a character walk. Such structures that involve sun and star repetition and indicate time and weather effects tend to be cyclic (Wilson & Wilson, 1983). The forces of nature would fall under the natural rhythm theme, according to the Wilson's (1983). Whereas non-Native people tend to interpret these themes and structures as simple actions, the native person regards a walk through nature or the rise and fall of each day as a life-affirming relationship. Thus what they depict may be more significant than how they depict it.

Computer play versus understanding. Teachers need to set limits on computer play (Stokrocki, 1986), especially of the mindless music videos. Some teachers prefer to let students be loose in the beginning, so they can judge their abilities and let them be more creative. On the other hand, some students may sit around waiting for help or directions. Such students need written or video step-by-step procedures. Instructors may utilize Kids Pix as

a drawing program at first but they need to emphasize these terms and possibilities as well. Teachers must identify the names of the program's tools, design terms, and transition effects. Teachers also need to include problems of contrast and sequence (when discussing animation examples. Results of this study support what Samuels (1986) earlier criticized--that children do not know why they make drawings. In addition, they know not the art terms for what they do. Perhaps learning "computer lingo" is unnecessary for beginners in computer animation and once they are "hooked" on it, then they can learn the technical terms?

More research on teaching computer animation and its problems and solutions is needed. Also imperative is research on how minority sociocultural populations use computer programs, select themes and subjects, and develop images. Students need to be challenged not only play.3 We have only begun to find the possible options to explore in teaching computer animation.

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